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ABSTRACT

The extensive use of instructional technology by the teaching profession will facilitate and encourage the differentiation of staff, increase the need for flexible organization of schools, force the profession to re-examine teaching methods in the light of new learning theories, necessitate major changes in both preservice and inservice teacher education, necessitate a reappraisal of certification requirements, and elicit questions from the profession regarding roles, rights, and responsibilities. (SP)

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Educational Technology and the Teaching Profession

by Lois V. Edinger*

While it may be true that there are members of the teaching profession whose first question (and real fear in some instances) may still be will educational technology replace the teacher, the vast majority have accepted the fact (or in some cases simply become resigned to it) that education must leave the era of "hand labor" and turn to machines to help increase the productivity of the human teacher. Statistics from population growth alone, both present and projected, are enough to convince one. Our elementary and secondary schools will have six million more children enrolled in 1970 than we had in 1960 according to present projections and college enrollments will have reached over seven million. Society cannot provide for the continuation of one teacher for a magical fixed number of pupils. One half of our population is now twenty-five years old and under; hence, the number of adults is too small to continue the present practice. One half of all college graduates would need to prepare to go into teaching to keep the present level, and this is neither likely to happen nor desirable, with the present needs for competent, skilled workers in many other fields and professions. That we must turn to the using of power tools in education to allow teachers to become more effective is a fact accepted by the teaching profession today, albeit with varying degrees of pleasure and readiness.

Although there are many aspects of this new technology one is tempted to explore, I shall address myself to the question posed by the commission and try to stay within the parameters suggested by it. What effect would the extensive use of instructional technology have on the teaching profession? By the

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teaching profession, I understand the question to mean not the process of using the technology in teaching per se; its advantages, and the like; but the changes or effects which may be predicted for teaching as a profession.

Extensive use of instructional technology will affect the profession in at least the following ways, I think.

1. It will facilitate and encourage the differentiation of staff.
2. It will increase the need for flexible organization of the school.
3. It will force the profession to re-examine teaching methodologies and look anew at learning theories and the most appropriate means of helping all children learn.
4. It will necessitate major changes in teacher education programs, both pre-service and in-service.
5. It will necessitate a reappraisal of certification requirements by State Departments of Instruction.
6. It will elicit a number of questions from the profession regarding the role of decision making of the teacher and the rights and responsibilities of the user (consumer) and the creator (producer) of materials for educational technology.

Facilitate and Encourage Differentiation of Staff.

A major effect of the extensive use of educational technology will be to speed the movement toward differentiated staff. Only through the reorganization of staff and personnel can the new advances in teaching techniques and technology be effectively utilized. Much waste has resulted through efforts to superimpose new techniques on the old system. Innovations must be planned for, not prematurely introduced, and then they must be fully integrated into the system. The Research and Policy Committee of the Committee for Economic Development states in the first chapter of its book, Innovation In Education: New Directions for the American School; "If the schools are to make

real progress in instruction, most of them must be jolted from their complacency by vigorous thrusts that will break through the old patterns and support experiment and innovation."[1] Increasing teacher productivity is a key to effectiveness in education. The introduction of team teaching and differentiated teaching functions should accompany effective utilization of instructional technology.

The National Commission on Teacher Education and Professional Standards, NEA, recently sponsored the Year of the Non-Conference to study the teacher and his staff. A number of papers, demonstration centers, and films were outgrowths of the year. "To add to the dialogue about school organization by suggesting some ways that teachers and technology can be brought together to create personalized educational programs" was the purpose given for a booklet sponsored jointly by TEPS and Center for the Study of Instruction.[2]

The Direct Instructional Team and Support Centers are proposed in this booklet. Let's stay with the idea of a team for a moment. Various groupings are possible for a team, but any grouping to emerge with extensive use of instructional technology would, I think, include technologists and paraprofessionals along with the instruction leader and assistant leader (Joyce), or professor and senior teacher (Allen). In any event, the profession must delineate roles and state responsibility, preparation needed, salary to be paid, etc., for the role performed. Teachers have been forced to be drill sergeants, clerks, traffic cops, nurses, substitute mothers and on and on for too long.

A break down of current practices shows the elementary teacher with 60.8% time for teaching, as opposed to 39.2 % for miscellaneous tasks. The same study shows that the high school teacher spends 51.4% of his time for teaching, 29.0% for related out-of-class instructional activities and 19.6% for miscellaneous activities. Teachers are on record in this country with a request for time to teach. It is for this reason, if no other, I feel teachers will welcome the use of technology in education, for it will relieve them of much of the routine and drill activity they are now called on to perform. Educational technology has demonstrated that it can do routine jobs and some teaching tasks as well as, or better than, a teacher. Computers can carry out drill and repetitive jobs easily and often more effectively than a teacher. Skill subjects may well come under the programming of the computer. The computer is already being used in a number of school systems to relieve the teacher of tasks incidental to teaching such as roll taking, grading papers, taking inventory, keeping attendance reports of various sorts. Paraprofessional assistants may relieve the teacher of other related, non-teaching tasks. All of this is germane to the discussion of the differentiated staff and the effective use of technology. It must be made clear at this point that teachers will not welcome nor accept the use of technology if they are not clearly and definitely involved in decisions about its use. The teaching profession will be greatly concerned about this decision making role, and I shall have more to say about this later.

Whether we use the Joyce model[3], the Allen model or the Mort model[4] for differentiated staff is not the major question. The important thing is to define the roles performed by a teacher and establish differentiated staff based on these roles. Extensive use of instructional technology will force the issue, for the teacher will be using a means of communication dependent upon an extremely complex and expensive apparatus; one which is not under his exclusive control and one which requires special technical knowledge to operate and to program. We must of necessity then build our instructional teams including technologists and graphic arts personnel, programmers and mediated teacher as well as classroom teacher. The teacher who works directly with the students will be the diagnostician for the learning situation and will know what resources are available to meet the needs.

Flexible Organization

In discussing differentiated staff and team teaching, one moves, of necessity, into the organizational pattern of a school. Flexible organization for instruction is of major concern in the effective use of technology. There are two major organizational patterns in so far as organization for instruction is concerned. The name of John Goodlad/is usually associated with reorganization of the elementary and junior high schools into an ungraded pattern, permitting the individual student to progress much more easily at his own rate. The profession, through its instructional leaders, has pointed out that the graded system is unrealistic in the sense of human variability. It might have been a technological solution to a chaotic problem in the

nineteenth century, but it does not suffice today. Whether the ungraded elementary school is the answer for 1968 yet remains to be seen. The requirements in terms of materials, individualized instruction and the like are frightening when placed against what is now available.

The flexible system of organization applied to the secondary school is usually referred to as the Trump Plan after its originator, Lloyd Trump. Trump has attempted to break up the "egg crate", 30 students to a classroom situation in the high school and provide for large group instruction (40 percent) small seminar instruction (20 percent) and individualized instruction (40 percent). This concept, formally referred to as the Staff Utilization Plan, is based on the idea of team teaching. Various aspects of this plan have been tried all over the United States, and the idea seems to be moving into practice. Where teachers have had opportunity to use it, there has been general acceptance. It should be emphasized that the Trump Plan is also postulated on a much wider use of instructional technology than now exists in the traditional school particularly for large group and individualized instruction.

It is my observation that simply having various types of educational technology will not result in its being used for individualized study if this must all come after school hours. Through some such form of flexible organization as the Trump Plan, the students should be given time during the school day and easy access to materials in order to facilitate individualized study. I have seen this pattern in operation in several schools, and the remarkable thing to many people, teachers among them,

is the constant and eager use being made by students of all the materials.

Organizational patterns, then, are directly related to and dependent upon instructional technology. The teaching profession will find itself moving more in these two directions, differentiated staff and flexible organization. For a look at how this might work, we may consider the model suggested by Dr. Joyce involving Direct Instructional Team and Support Centers which shows the close relationship between the teaching team and instructional technology.

In the Computer Center, the staff includes two teachers who are specialists in computer-assisted instruction, several paraprofessionals including computer programmers and personnel who are temporarily assigned to the center for various purposes. These people are specialists in the application of computer technology to problems of curriculum and instruction. They develop computer simulation, automate canned programmed instruction materials, adapt them for use in the local schools and work with other support centers to automate other procedures. One computer support center serves about twenty direct instruction teams.

The Self Instruction Center can serve five to six direct instruction teams. Contained in this center are programmed materials, self-instruction materials, either bought from commercial firms or made by specialists at the school. Such a center should have the capacity to develop materials on its own.

The Inquiry Center contains a wide assortment of materials such as slides, records, tape recording, listening and viewing

stations. In this center there must be subject specialists who are responsible for seeing that materials are adequate in each subject as well as serving in other capacities with the team.

The Materials Creation Center calls for another group of specialists such as professional writers, artists and audio-visual specialists. By creating materials to meet needs in the school, the center frees the school from over-dependence on commercial firms and at the same time provides material uniquely suited in a given situation. It is far better from my point of view to have materials prepared by professional educators than to have the profession reduced to purchasing a product designed by industry just for marketing.

In like manner, specialists are needed for the Human Relations Center and the Guidance and Evaluation Center.[5] To be sure, this is an ambitious sort of model. Most of our schools will not have as elaborate structure as this right away, but modified patterns will be found in the majority of our schools in the next five to ten years, I believe.

Teaching Methodologies and the Learning Process

Coupled with the first two effects is a third which is that the teaching profession must accelerate its examination of the process by which learning takes place. To put it another way, we must be concerned with the psychological orientation of technological materials within the teaching-learning process. The profession must have some fairly firm ideas on this matter if the program in the machines and proposed texts are to be appropriate and valid.

Each new resource must be examined from the point of view of its usefulness in the learning situation. Will it contribute to learning for any child or any group of children? What are its special properties, its strengths, its limitations in the instructional context? Unless we examine each resource in this way, we may find we are simply doing better what we should never have been doing anyhow. We don't need glamorous ways to accomplish dull jobs which may have little learning value.

James Finn in dealing with this problem writes, "The current situation, however, within educational psychology is, to say the least, mixed. Very few theorists or practioners would be willing to say that one given point of view has achieved all the answers. In the general practice of schoolkeeping today, an eclectic point of view as to theory coupled with a large portion of experience -- passed-on-down constitutes the operational base."[6]

The majority of teachers are certainly familiar with Professor Bruner's point of view in the area of instructional technology today and of the influence this view had on the Zacharias group which began the national curriculum reform movement with the physics course of the Physical Science Study Committee. They are also aware of the current discussion of the difference between Bruner's and Skinner's points of view.

There are those in the profession who fear a conditioning of behavior such as Skinner's theory describes and others in the profession who are antitechnological, anti-any-machine. They see the machine as stifling creativity and learning. While

they may not understand or completely accept the Skinner theory in totality, they, none-the-less, fear the overemphasis on machines. Serious questions have been raised about the extensive use of instructional technology - notably the computer. Mary Gardiner Jones writing in AAUW Journal lists a few of these fears which some people in the teaching profession have voiced. Students may depend too exclusively on the computer for validation of their identity and intelligence. The students may have their assumption reinforced that there is a right answer for every question. Students may be pushed into a purely reactive role, responding to stimulus but not initiating problems or questions. This reactive role would not produce creative, imaginative minds. Students may become "in essence mere extensions of the machine, informed about things which can be programmed and be computerized and mindless about the things which make man human."[7]

The fear that television or technology will replace the teacher has been put aside, I believe. If not, our earlier discussion of the specialized roles needed in the school of the present and future should help overcome any such fear. Indeed, we shall need additional personnel if anything, but of a different sort, and with different responsibilities and preparation. The teacher will not be replaced, but re-placed in the organizational pattern, perhaps.

In the man-machine era which we are now entering, technology can assist in routine drill aspects of teaching - learning, and

free the teacher to do that which is intensely human; that which he is uniquely capable of doing - to question, imagine, invent, appreciate, act as guide, model or counselor. It may even be of some consolation to the student that a machine in a drill routine remains patient, encouraging and affirmative. At that point, it may be better not to have the humaness of the "real" teacher, whose human impatience may be an inhibiting factor in the learning environment.

Nowhere in my reading have I found any indication that the teacher will be replaced by any form of instructional technology, but there are strong indications that the teaching-learning process will be increasingly handled by a versatile teacher assisted by instructional technology of various forms.

In a speech delivered to the Mid-Cities Superintendent's Conference, Dr. John Henry Martin makes a strong plea for providing for the use of all the senses in the structured environment. He states, "At present, we cannot predict differences in sensory styles from one child to the next. Consequently, curricular material has never been seen as needing to be prepared for those who are dominantly one sense minded as distinct from another. And if we could, there is reason to believe we shouldn't. This much we know: that whatever the dominance of one sense over the other, they are mutually supportive and in learning all are used. If the structured environment called curriculum or technology fails to make possible the conscious or unconscious exploitation of these separate pathways to the brain in the random fashion required by the range of human differences, then the curriculum and technology emasculate

learning. We can and do learn through the eye alone. We can and do learn through our ears. But we learn better, and in some cases, we can only learn, if the learning environment, the technology, permits each of us to probe it with a sensory mix unique to himself."[8]

Dr. Wigren quotes Father John Culkin from a recent interview: "Kids are natural citizens of the electronic age. The new media are the liberal arts of that age. Kids learn more on the tube than they do in school." When asked what we should be doing about this, Father Culkin responded: "Educate the emotions. That's where the game is. Tune up the sensorium. Go after the kinetic, the tactile, the aural... Kids today are learners in a new way, products of the all-at-once environment. They feel out of it in a one-thing-at-a-time school environment. Introduce them to form, structure, gestalt. Guide them to be their own data processors, to operate through pattern recognition. Kids should be taught how camera angles lie, how cartoons are animated. Then they should make films of their own. That's where it's at--an all media literacy, doing instead of consuming."[9]

Students should be encouraged to use the media to express their feelings; their ideas; to communicate. They don't always have to be consumers; they can become creators.

The teaching profession is cognizant of the need for options if a truly vigorous, personal, intellectually sound education is to be created. Teachers and pupils need a rich laboratory of books, audio-visual media, and other technological resources to create the basic types of learning situations

to meet needs of students. Advancing technology and new understanding will make it possible for the teacher to prescribe for each child the learning materials and teaching strategies which closely match his achievements, ability and learning style.

Changes in Teacher Education

Effective employment of new instructional technology will demand new skills and more vigorous education of the teacher. Teachers should be taught to use the new technology and how to produce programs and materials. Not all teachers will desire to become skilled technicians, to be sure; but my experience with In-School Television convinced me that teachers used the media more readily and more effectively when they understood at least a little of what went into the production of the studio lesson. The same will no doubt be true for other forms of technology. No teacher training institution really prepares teachers for television or other mediated experiences. Most of the teachers learn on the job. Skill in the use of audio-visual or mediated materials is more desirable but not as common as production skills. When teachers move from users of materials to producers or creators of materials, they need the skills to help them create these materials. Another problem arises when teachers move from classroom to studios; for example, television teachers do not have the freedom to use copyrighted materials that classroom teachers have under fair use, and for this reason, they and other creators of materials need a broader understanding of the copyright law.

From this discussion, it is clear that teachers need new skills; they need to understand educational technology so they can use it creatively; they must understand the copyright law; they need to learn their rights and how to protect them; they need to learn their broader responsibilities as they use the technology. They must learn to evaluate technology as to its legitimate use in the learning process. Along with this must come basic changes in attitude and approaches for large numbers in the teaching profession. The extensive use of instructional technology then means changes in teacher education programs.

In education there is a tendency toward conservatism and resistance to change. There are obvious reasons for this, not the least of which is the fact that schools traditionally have reflected the dominant culture in society. Teacher education has played its part by preparing teachers to maintain the status quo in schools. Teachers are prepared for schools as they are at the present without much attention being given to what may be happening in a few years; hence, teachers begin looking for in-service courses almost as soon as they are in their first position.

Continuing education programs for teachers, or in-service programs, could be established on the basis of individualized instruction if we will use educational technology. If it works for students in the public schools, it should work for teachers. Not all needs could be met in this fashion, but refresher courses in skill subjects might be handled this way.

Because of the increased interest in technology, there has come a concern for improving teacher education, for however sophisticated and useful the machine may become, it will always be an instrument employed by human educators. Teacher education therefore,must have curricula designed to include adequate instruction in values and use of both conventional and new educational media. Programs are needed to upgrade and update not only subject matter competence but capability in utilizing advanced teaching technology. Teachers need to know what technology to use, how to use it effectively, and how to evaluate its use in the learning environment. Some members of the profession will need to concentrate on programming for computers, machines of various sorts, or programmed textbooks. At the moment, industry is taking over the production of software; this was not the case in the writing of text books - a professional person was engaged to write. It is my belief that a professional person should be engaged,perhaps with technicians from industry, perhaps on his own, but more particularly in consultation with other teachers in preparing materials to be used in programmed courses. These materials should then be field tested under competent supervision. As we differentiate roles, teacher preparing institutions will need to reassess programs offered and plan for differing roles. All members of the instructional team may not need a full four years in college; some may need more. Preparation for various roles must be provided in schools of education and in technical schools where needed. Technologists and other specialists, perhaps some from industry, may make contributions to learning under the

direction of competent, qualified teachers.

Some efforts are being made to change teacher education programs to meet the growing utilization of instructional technology. In August, 1967, Multi-State Teacher Education Project issued a monograph entitled "Television and Related Media in Teacher Education." Dr. Harold E. Wigren in the introduction, made the following statement: "The widespread fusion of technology and education is rapidly becoming more the rule than the exception in our nation's schools and colleges. Innovative practices, which employ with considerable sophistication the use of television and other technologies are to be found in increasing numbers at all levels of education. These practices indicate the growing willingness -- and determination -- on the part of educational leaders to make creative application of technology in the solution of instructional problems."[10]

Since the experiments described deal primarily with the use of television, I shall not discuss them further here. This does, however, point up the growing concern of schools of education for the newer technology. Changes must come in teacher education programs if there is to be extensive use of technology; otherwise, teachers entering classrooms will not be able to make productive or effective use of instructional technology.

Certification Requirements

It should be obvious at this point that State Departments of Public Instruction and the certifying agencies of the state

will need to reappraise the certification requirements and assignment of personnel. Whether this will mean new certificates with new programs, I know not. We will need to make provision for employing persons who are not licensed as teachers. At the moment, some states and school districts might have difficulty in getting the type personnel needed for extensive use of instructional technology. Schools will need a degree of flexibility which many do not now seem to have. It also appears to me that the profession will need a greater voice in the process of licensing teachers and in policy matters relating to organization and curriculum. Teachers will generally respond positively to innovations if they are involved from the outset and involved continuously. Since certification requirements vary from state to state, I shall not attempt a detailed discussion but suggest this as an area of concern.

Teacher Rights, Responsibilities and Decision Making

A final effect of the extensive use of instructional technology will be to raise questions from the profession concerning a teacher's rights - academic or legal - in this entire area and the role of teachers in decision making. One can safely say these rights are imperfectly understood at the present. The Division of Audio-Visual Services of the National Education Association as early as 1963 devised a policy statement concerning professional rights and responsibilities of television teachers. AAUP in its Autumn Issue (Sept. 1968) presented a statement on Educational Television, for its members' reactions. This statement contains many of the same principles contained in the policy statement of NEA.[11]

Little attention has been given to a faculty's authority in determining policies and procedures for the use of television or other media at either the public school or university level. Dr. Wigren puts this matter quite graphically in a recent address: "Admittedly, there exists in some quarters an uneasiness --and not without justification--that decision making with respect to the design and role of learning systems or packages will be gradually vested in a master educational engineer who is seemingly all-wise and omnipotent and who decides, in his great wisdom, what part (if any) the teacher will play in the system at any given time. Under this arrangement, the teacher becomes a monitor, or a cog in the system's wheel, with his own freedom of choi e and initiative divested. When this happens, the teacher becomes "programmed" every bit as much as the computer! Fortunately, this need <u>not</u> be the shape of things to come!

Properly conceived, a systems approach can -- and <u>must</u> -- provide ample opportunities for decision making on the part of both the teacher and learner to ensure that each develops to his full potential."[12] I believe that decision making will be one of the major concerns of teachers and is even now one of the items for negotiations in a number of school districts.

Since it is possible under the use of instructional technology for a teacher's demonstration and lectures to be recorded and reused without the teacher's being present, a host of questions will be raised by the profession. Among these will certainly be the following: What will be the residual rights of teachers? Are there "residual" rights or only rights

reserved in a contract? Who will own the television program, the packaged system, the programmed text material? Should the teacher have rights in regard to revision of the content? If so, what rights and to what degree? Should teachers have the right to withdraw a program if information becomes obsolete? Should the teacher have any control over the modification of his program by others? What controls, if so? Could some of these matters be handled through school or university policy in regard to salary adjustments, released time, etc., granted the teacher? Who owns supplementary materials that go to make up the packaged system? What sort of contractual arrangement should be made? Will problems of certification and accreditation arise at the public school level if non-certified persons are used to prepare materials or teach? What relationship should exist between local, state, regional and national agencies involved in production and dissemination of materials? What about local control of curriculum?

There will be other questions; these only suggest the range of questions likely to arise. These questions will need to be negotiated in every situation as they arise. The Division of Educational Technology (formerly DAVI of NEA) conducted a recent survey of practices on the professional rights and responsibilities of teachers in new media. Policies for television teachers were the chief concern from the survey, but it was the feeling of the investigators that policies for teachers in other media were based on much the same criteria. Key areas to be examined before an agreement is entered into were listed from the survey: salary, work load, program ownership, ownership of supplemental

materials, revision of programs, terminating program use, reuse within the contracting institution, reuse within the contracting institution but for purposes other than originally intended, reuse outside the contracting institution, special uses outside the contracting institution, contract reevaluation or renewal, liability.[13] For a more detailed understanding of some of the current contract practices, I would recommend a reading of the report.

There will be some difference in the approach from the public schools and from a college or university since public schools are turning more to the team approach which will be handled in one fashion, while at the university level, we still have primarily a solo performance by an individual professor. In any projections for expanded use of technology, the teaching profession will seek to find satisfactory answers to the questions raised here.

In an effort then to determine the effect which the extensive use of educational technology will have on the teaching profession, I have suggested and discussed six broad areas. All of these are related; some are interrelated. Any plan to promote extensive use of technology should be responsive to these effects.

The teaching profession finds itself caught between two realities; the need to increase teacher productivity through the use of instructional technology, and the need to maintain and enhance the teacher's uniquely human role in the teaching-learning process. To keep a proper balance between these two,

will be a primary goal of the teaching profession as it seeks to meet its obligation to society to provide equal educational opportunity for all children and youth.

[1]Research and Policy Committee of the Committee for Economic Development. Innovations in Education: New Directions for American Schools. (New York: Committee for Economic Development. July, 1968) p. 11.

[2]Bruce R. Joyce, The Teacher and His Staff, Man Media and Machines. (Washington, D. C. National Commission on Teacher Education and Professional Standards and Center for the Study of Instruction. 1967).

[3]Ibid.

[4]TEPS Year of the Non-Conference, Occasional Papers: Bernard H. McKenna "School Staffing Patterns": (for the Mort Model.) Dwight W. Allen, "A Differentiated Staff: Putting Teaching Talent to Work." (Washington, D. C., National Commission on Teacher Education and Professional Standards).

[5]Joyce, Op. Cit. pp. 12-14.

[6]James D. Finn, "The Emerging Technology of Education." Instructional Process and Media Innovation, Robert A. Weisgerber, Editor. (Chicago: Rand McNally and Company, 1968.) p. 306.

[7]Mary Gardiner Jones, "Computer Assisted Education: A New Challenge in Social Responsibility." AAUW Journal, Vol. 62, No. 1 (October, 1968), p. 4.

[8]John Henry Martin, "Making Technology Behave." An address delivered to the Mid-Cities Superintendents Conference, Pasadena, California, October 15, 1968.

[9]Harold E. Wigren, "The Effects of Communication Media on the Educational Process." An address delivered at the International Conference on Communication Media in Education, Halifax, Nova Scotia, September 26-28, 1968.

[10]Howard E. Bosley and Harold E. Wigren (Editors), Television and Related Media In Teacher Education (Baltimore, Maryland: Multi-State Teacher Education Project, August 1967).

[11]"Statement on Educational Television," AAUP Bulletin. Washington, D. C. American Association of University Professors. Vol. 54, No. 3, (September, 1968).

[12]Harold E. Wigren, "The Effects of Communication Media on the Educational Process." Op. Cit.

[13]Donald Mikes, "Contract Practices for TV Teachers." (Mimeographed) Washington, D. C., Division of Educational Technology, NEA. (September, 1968.)